Mathematics Subject Template

(Required Information needed to prepare for course submission)

- **Course Guidance**

GENERAL MATHEMATICS GUIDANCE

NOTE: Courses below Elementary Algebra are not considered college preparatory and are not appropriate for satisfying the "c" mathematics requirement.

The intent of the mathematics requirement is to enable students to develop the ability to think mathematically as well as to provide background and skills for classes and disciplines with specific mathematical content.

Goals of the Mathematics Requirement

The overarching goal of the subject requirement in mathematics is to ensure that freshmen are adequately prepared to undertake university-level study. Courses in the "c" subject area recognize the hierarchical nature of mathematics and advanced courses should demonstrate growth in depth and complexity, both in mathematical maturity as well as in topical organization. Although many schools will follow the Algebra I – Geometry – Algebra II format outlined in the 1997 California Standards, other sequences may treat these topics in an integrated fashion (such as the Interactive Math Program - IMP). Combinations of IMP, algebra, geometry and other courses can also satisfy the "c" subject requirement. Appendix A [PDF] of the Common Core State Standards in Mathematics offers a starting point for developing courses in either Pathway that align with these Standards.

More important than the topics covered, or even the skills used directly in class, are the more general abilities and attitudes that should be gained in the effort of mastering the content. These include fostering:

1. A view that mathematics makes sense: it offers ways of understanding and thinking; it is not just a collection of definitions, algorithms, and/or theorems to memorize and apply.

2. A proclivity to put time and thought into using mathematics to grasp and solve unfamiliar problems that may not match examples the student has seen before. Students should find patterns, make and test conjectures, try multiple representations (e.g., symbolic, geometric, graphical) and approaches (e.g., deduction, mathematical induction, linking to known results), analyze simple examples, make abstractions and generalizations, and verify that solutions are correct, approximate, or reasonable, as appropriate.

3. A view that mathematics approximates reality and mathematical models can guide our understanding of the world around us.

4. An awareness of special goals of mathematics, such as clarity and brevity (e.g., via symbols and precise definitions), parsimony (removing irrelevant detail), universality (claims must be true in all possible cases, not just most or all known cases), and objectivity (students should ask "Why?" and accept answers based on reason, not authority).

5. Confidence and fluency in handling formulas and computational algorithms: understanding their motivation and design, predicting approximate outcomes, and computing them -- mentally, on paper, or with technology, as appropriate. Mathematics is a language, fluency in it is a basic skill, and fluency in computation is one key component.

Approved "c" subject area courses must demonstrate how students acquire these competencies. A guide for the approaches and content expected in the "c" subject area courses is the Statement on Competencies in Mathematics Expected of Entering College Students, from ICAS, the Intersegmental Committee of the Academic Senates of the California Community Colleges, the California State University and the University of California. Courses submitted to UC for "c" approval must demonstrate they include approaches discussed in Section 1 of the ICAS document – merely listing standards to be covered is not sufficient. Further perspectives can be found in the Common Core Mathematics Standards for Mathematical Practice and in Understanding University Success [PDF] (The Center for Educational Policy Research, 2003), and in Principals and Standards for School Mathematics, (National Council of Teachers of Mathematics, 2000).

Course Requirements

Regardless of the course level, all approved courses are expected to satisfy these criteria:

1. Courses should be consistent with the goals described above. Courses that incorporate the Common Core Standards for Mathematical Practice will be taking a substantial step towards achieving these goals.

2. The content for these courses will usually be drawn from the Common Core State Standards for Mathematics. While these standards can be a useful guide, coverage of all items in the standards is not necessary for the specific purpose of meeting the "c" subject requirement. Likewise, simple coverage of all standards is not enough to assure course approval. For success in college, secondary mathematics teachers should help students learn to assimilate the major ideas and principles that

encompass the standards rather than treating the standards as a check-off list. The ICAS Statement of Competencies in Mathematics can provide guidance in selecting topics that require in-depth study.

3. One unit must either be a course in geometry or part of an integrated sequence that includes sufficient geometry, such as IMP I, II, and III (see note below for acceptable course combinations).

4. One-year mathematics courses (e.g., algebra) taken over three or four semesters are acceptable to meet the (c) Mathematics requirement, but credit will be granted for only one year (two semesters) of work. For students utilizing this pattern, all grades awarded by the school are averaged in the GPA calculation.

5. Completion of advanced mathematics courses with a grade of "C" or higher can validate an earlier grade of "D/F" in the sequence provided that the material in the advanced course substantially builds upon the earlier course. Typically, Algebra II validates Algebra I but not Geometry.

6. Courses selecting topics from the 1997 California Standards as a base usually receive the following unit values: Algebra 1 (1 unit), Geometry (1 unit), Algebra II (1 unit), Trigonometry (1/2 unit), Mathematical Analysis (1 unit), Linear Algebra (1/2 unit), Probability and Statistics (1/2 unit), Advanced Placement Probability and Statistics (1 unit), and Calculus (1 unit). Trigonometry is usually embedded in Algebra II, Mathematical Analysis, or pre-Calculus, and the preceding refers only to stand alone courses. Most courses titled pre-Calculus are based on selected Trigonometry and Mathematical Analysis standards and receive 1 unit. Although not listed in the California Standards, each course in a rigorous integrated sequence (such as IMP I, II, III, IV) receives one unit.

7. Courses that are based largely on repetition of material from a prerequisite or prior course (for example as test preparation or pre-college review) will not be approved.

8. Other rigorous courses that use mathematical concepts, include a mathematics pre-requisite, and that are intended for 11th and 12th grade students, such as discrete mathematics or computer science may also satisfy the requirement. Such courses must deepen students' understanding of mathematics by incorporating the depth implied by the Competencies statement.

HONORS MATHEMATICS GUIDANCE

- Math Honors courses are expected to provide both breadth and depth of exploration in the subject area, developing writing, research, and analytical skills. Specific detailed evidence must be included in the course outline.
- The courses must offer content and/or experience that are demonstrably more challenging than what is offered through the regular college preparatory courses in the same field.
- Factors considered for UC-approved honors courses that satisfy the "c" requirement include but are not limited to the assignment and evaluation of one long or numerous short, challenging, and properly-annotated research papers and a comprehensive final examination. Specific details of each of the assignments are required.
- The use of college-level textbooks is encouraged.
- Regular college preparatory courses in the subject areas should be offered. If regular non-honors courses are offered, a strong justification for the lack of a regular course is required.
- In addition to AP and IB higher level courses, high schools may certify as honors level courses **not more than one unit** in mathematics.
- A single, written, comprehensive, full year final exam must be administered that encompasses all the material that has been covered for the entire year.

- **Course Content**

NOTE: The following questions are subject specific and ask for detailed information regarding the course curriculum. Since UC has developed their own criteria for the review of curricula, it is not necessary (and preferred) that the State Standards are not listed when submitting course descriptions to the University. When preparing the course submission, keep in mind that your audience is the UC High School Articulation unit and UC faculty. Include relevant information that would assist those reviewing the course and provide UC a better understanding and clarity about the intent of the curriculum. UC expects to see information that would show specific, detailed evidence of the course rigor and development of essential skills and habits of mind. Course template components need to be more expository and illustrative of the integration of each course component and how the overarching goals are being accomplished. The text boxes below will expand to accommodate additional text.

Course Purpose: *What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Explain how the course aligns the five goals of the Mathematics requirement. (How these will be accomplished should be reserved for the Course Outline, Key and Written assignments, Assessments, and/or Instructional Methods.)*

NOTE: More specificity than a simple recitation of the State Standards is needed.

The purpose of this course, Integrated Mathematics One (IM 1) and Information and Communication Technologies (ICT) is to provide learning opportunities to students about programming while learning mathematics. The goals and expected outcomes of this course focus on reasoning with linear equations and inequalities by formalizing and extending the mathematics that students learned in the middle grades. It also links the relationship between linear relationships by contrasting them with exponential phenomena while applying linear models to data that exhibit s linear trend. This IM1/ICT course is organized into five units: 1) reason with linear equations and expressions by using quantities to model and analyze situations, to interpret expression, and to create equations, 2) explore functions and interpret functions graphically, numerically, symbolically, and verbally as well as interpret the linear and exponential relationships, 3) build upon prior students' prior experiences with data by providing students with more formal means of assessing how a model fits data through descriptive statistics, 4) establish triangles congruence criteria, based on analyses of rigid motions and formal constructions and solve problems about triangles, quadrilaterals, and other polygons through learning deeply about congruence, proof, and constructions, and 5) connect Algebra and Geometry through coordinates. Additionally, the Standards for Mathematical Practice are applied throughout each unit with the content standards in order to provide learning experience of mathematics and programming as a coherent, useful, and logical process that makes sense in solving problems. This Integrated Mathematics I (IM 1) with Information and Communication technologies (ICT) is the first course in the series of three that are all aligned to the existing course, Algebra 2 for the 21st Century. This course, IM 1/ICT, focuses on the mathematics subject matter called for by the CCSSM, but more importantly, it articulates the integrated projects of key assignments, formative and summative assessments, and other activities and instructional strategies which require that students demonstrate the deep understanding of ICT skills.

Course Outline: A *detailed descriptive summary of all topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered. A mere listing of topics in outline form is not sufficient (i.e. textbook table of contents or California State Standards).*

Course description

This course, Integrated Mathematics One (IM1) and Information and Communication Technologies (ICT) is designed for students who value applications of integrated concepts of mathematics and have a desire for a career in computer programming. This course focuses on formalizing and extending the mathematics that students learned in the middle grades. The content of the course includes number and quantities, algebra and functions of Algebra 1, Geometry, Statistics and Probability, and essential basic algebra and functions of Algebra 2. This course targets on meeting the a-g's "c" requirements through combining the mathematical understanding with Information and Communication Technologies (ICT) pathways: games and simulations and software and systems development. As students research, analyze, and modify existing programming code and develop their own systems of coding through the platform, Scratch, students understand the elements of creating games and simulations. The course's critical areas are organized into units by deepening and extending understanding of linear relationships, in part contrasting them with exponential phenomena, and in part by applying linear models to data that exhibit a linear trend. In addition, the course uses properties and theorems involving congruent figures to deepen and extend understanding of geometric knowledge from prior grades. This course, Integrated Mathematics 1 with ICT, centers on the depth and complexity of enduring mathematical understanding through the unit programming projects. Understanding and gaining proficiency in games and simulation pathway of ICT, students also explore various ethical issues around the twenty-first century's increasingly rapid development of technology and its cultural impact on society.

Context for Course

This entry level course, Integrated Mathematics 1 (IM 1) with Information and Communication Technologies (ICT) integrates concepts requiring students to reason quantitatively, see structure in expression, create equations, reason with equations and inequalities, interpret functions, build functions, construct and compare linear, quadratic, and exponential models, experiment and understand

congruence, express geometric properties with equations, to interpret categorical and quantitative data in a programming environment.

Developing high school students' college and career readiness has a direct impact on America's workforce and the global workforce. College and career readiness can be achieved thorough high schools offering "a-g" curricula and the students' completion of the "a-g" courses. The opportunity for students to learn a set of rigorous and relevant interdisciplinary subjects is likely to promote high school graduation rates, decrease drop-out rates, and increase college matriculation rates as well as the likelihood that students graduate career-ready. The rationale for creating this IM 1/ICT course is all about enhancing college and career readiness in preparing the economic future of this nation by developing an effective workforce of young citizens.

Within the next decade, 8 in 10 job openings in the United States will require a postsecondary education or training; high school graduates are more than twice as likely as college graduates to be unemployed; 45% of the fastest-growing occupations in the next ten years require a bachelor's degree or higher; by 2018, 63% of job openings will require workers with at least some postsecondary education or training; and most jobs that pay enough to support a family and point toward a meaningful career require some level of postsecondary education or training. Realizing the data and its possible outcome, it is crucially important for high schools to provide curricula that will support our students to meet the requirements of "a-g" and assist them to complete those courses successfully.

Connecting mathematics concepts while building on their knowledge in ICT pathways, students have opportunities to acquire meaningful and relevant learning which contributes positively in establishing individual student's learning goals that leads to postsecondary learning and career readiness. By helping students to realize the employment opportunities that are available among the ICT pathways, students are likely to stay motivated and pursue their career goals. The content of the programming environment addresses the Career Technical Education (CTE)'s two ICT pathways of software and systems development and games and simulation. As an integrated course utilizing higher level of high school mathematics concepts in a programming environment, this course guides and equips students to understand about programming which generates motivation in learning mathematics through problem solving.

Learning mathematics within the ICT environment helps students to identify and apply the systems development process, create effective interfaces between humans and technology, develop software using programming languages, and test, debug, and improve software development work. In doing so, student apply its knowledge and skills to the world of IT and Math which prepares them to compete in the global economy by constructing a set of new knowledge and critical thinking. The applications of the knowledge through IM 1/ICT allow students to experience the enveloping communication, developing people skills through teamwork, and generating independent and collaborative problem solving opportunities.

History of Course Development

In November 2012, a grant called, UCCI Pathways Grant, was applied and awarded to develop three integrated mathematics courses that vertically align with an existing UCCI course, Algebra 2 for the 21st Century. In January 2013, three teams of twelve high school teachers and a Teacher on Special Assignment (TOSA) developed three Integrated Math (IM) courses by focusing on subject area "c" with two layers of standards: California Common Core State Standards for Mathematics (CCCSSM) and Standards for Mathematical Practice (SMP). In addition to the mathematics subject area focus, this course integrates Career Technical Education (CTE) industry sector Information and Communication Technologies (ICT). Although it has been challenging to create an integrated course that connects with the ICT pathways according to the intended integrated mathematics content of the CCCSSM and its SMP, the teachers purposefully targeted on rigor and relevance and higher level mathematical understanding for all students by deepening and extending the conceptual and procedural fluency, problem solving, mathematical modeling, and communicating reasoning. Finally, the thirteen educators

created three innovative sequences of courses with the newly emerging integrated mathematics content through a programming lenz by infusing core foundational and higher level math concepts with relevant career technical components.

Unit 1 Overview – Reasoning with Linear Equations and Inequalities

Students use quantities and appropriate units of measure to model and analyze situations, to interpret expressions, and to create equations to describe situations. Analyzing and explaining the process of solving a system of equations and justifying its problem solving processes, students develop fluency, writing, interpreting, and translating between various forms of linear equations and inequalities. Students explore and interpret equations and inequalities and systems of equations and inequalities graphically, numerically, symbolically and verbally. All of this work is grounded on understanding quantities and relationships between them.

To integrate unit 1 concepts with Information and Communication Technologies (ICT), a programming platform, Scratch, is used to help students to understand the basics of programming. Students create a program that simulates the monthly payment of purchasing a used or new car. Using proper programming syntax that is to be reinforced with Scratch's programming language, students design an effective interface between users and technology. The experience gained in programming the car purchase can be expanded into building websites for automobile dealers.

Unit 1 integrates two Standards of Mathematical Practice (SMP): make sense of problems and persevere in solving them (SMP 1) and attend to precision (SMP 6). Students develop the view that learning mathematics is a sense making process which is much more than just a collection of definitions, algorithms, and memorizing theorems. At the same time, students develop the value of precision at all levels of doing and understanding mathematics as they reason with linear equations and inequalities.

Major Topics

Unit conversions,
Rounding,
Use of appropriate units,
Expressions,
Order of operations,
Create equations and inequalities in one variable,
Create equations and inequalities in two or more variables,
Constraints,
Domain/range,
Rewrite formulas for a given variable,
Solve linear equations in one variable,
Explain steps in solving simple equations,
Explain steps in solving systems of equations,
Understand the graph of an equation in two variables,
Explain graphic representation of a solution of equations,
Graph linear inequalities and systems of linear inequalities,
Identifying a series of steps for a task
Running the same sequence multiple times (iterations or looping),
Making things happen at the same time and making decisions based on conditions,
Support for mathematical and logical expressions,
Sort, retrieve, and update values,
Integrate media into a full project using appropriate tools,
Test software and projects,
Evaluate results against initial requirements,
Debug software as part of the quality assurance process,

Understand the methodologies for integrating digital media into a game or simulation,
Design effective and intuitive interfaces using knowledge of cognitive, physical, and social interactions,
Create an online project and e-portfolio,
Define and analyze systems and software requirements

Resources

Teen cell Phone Use Increases
http://www.pewinternet.org/Reports/2009/14--Teens-and-Mobile-Phones-Data-Memo.aspx

Cars.com – www.cars.com
This is a free online website that is used to research the cost of purchasing a vehicle as well as finding fuel economy.
The website also provides a finance calculator that students use to calculate the monthly costs of a new car. (unit 1)

Math Assessment Project (MAP)/ Math Assessment Resources Services (MARS) Problems form the Shell Centre
http://map.mathshell.org.uk/materials/tasks.php

Smarter Balanced Test Items
http://www.smarterbalanced.org/wordpress/wp-content/uploads/2011/12/Math-Content-Specifications.pdf

URL Resource for Algebra 1, Geometry, Probability and Statistics, and Algebra 2:
www.mcdougallittell.com

http://scratch.mit.edu

Learning to Scratch (Calder, 2010)

Scratch 1.4 (Badger, 2009)

Unit 2 Overview – Linear and Exponential Relationships

Students learn function notations and develop the concepts of domain and range. They move beyond viewing functions as processes that take inputs and yield outputs; furthermore, they start viewing functions as objects in their own rights. As students translate between representations and understand the limitations of various representations, they explore many examples of functions including sequences. They interpret functions graphically, numerically, symbolically, and verbally. Students work with functions given by graphs and tables, keeping in mind that depending upon the context, these representations are likely to be approximate and incomplete. Their work includes functions that can be described or approximated by formulas as well as those that cannot. When functions describe relationships between quantities arising from a context, students reason with the units in which those quantities are measured. Students build on and extend their understanding of integer exponents to consider exponential functions. They compare and contrast exponential functions, distinguishing between additive and multiplicative change. Additionally, they interpret arithmetic sequences as linear functions and geometric sequences as exponential functions.

To integrate unit two with ICT, students create functions that work for game challenges to apply mathematics through the platform, Scratch, students create functions that work for a simulation to apply mathematics. Students tackle linear and parabolic motion. After researching the differences of motion between a train and an airplane, students summarize and simulate their findings of differences and similarities of linear and exponential relationships. By creating a

simulation that puts a train's linear motion in comparison to an airplane's parabolic motion, students compare the speed the airplane needs to travel in order to overcome the added distance of flying through the air. They calculate minimum/maximum values and zeros of quadratic functions and apply them to writing a program. By using different authoring tools, students apply the basic processes of input, processing, and output.

The unit 2 combines two Standards of Mathematical Practice (SMP): reason abstractly and quantitatively (SMP 2) and construct viable arguments and critique the reasoning of others (SMP 3). Students develop a gradual and natural propensity to put time and thought into using mathematics to grasp and solve unfamiliar problems by stating assumptions, definitions, and previously established results in constructing arguments. By justifying their conclusions, communicating them to others, students analyze situations by breaking them into apart as well as putting them together while exploring the linear and exponential relationships.

http://scratch.mit.edu/projects/puneri/2294898

Major Topics

Understand domain and range,
Using function notation,
Recognize sequences are functions,
Interpret key features of graphs and tables,
Sketch graphs showing key features,
Relate domain of a function to its graph,
Calculate average rate of change of a function,
Graph linear and exponential functions,
Compare properties of functions,
Write functions describing relationships between two quantities,
Write arithmetic and geometric sequences,
Identify effects of translations on graphs (primarily vertical),
Distinguish between situations that can be modeled with various functions,
Construct a function given various items,
Observe the difference between linear vs. exponential growth,
Interpret the parameters of a function in terms of context,
Calculate minimum/maximum values and zeros of quadratic functions and apply them to writing a program,
Use different authoring tools and apply the basic process of input, processing, and output,
Evaluate results against initial requirements,
Create an online project and e-portfolio,
Design effective and intuitive interfaces using knowledge of cognitive, physical, and social interactions, and
Support methods of accessibility for all potential users including users with disabilities and non-English speaking users

Resources

Math Assessment Project (MAP)/ Math Assessment Resources Services (MARS) Problems from the Shell Centre http://map.mathshell.org.uk/materials/tasks.php

Smarter Balanced Test Items http://www.smarterbalanced.org/wordpress/wp-content/uploads/2011/12/Math-Content-Specifications.pdf

LEMA Project
http://www.lema-project.org/web.lemaproject/web/dvd_2009/english/teacher.html

Modeling Problems at COMAP

http://www.mathmodels.org/problems/

Handbook on Modeling (COMAP) Sampler
http://www.comap.com/Philly/CCSSModelingHB.pdf

http://scratch.mit.edu

Learning to Scratch (Calder, 2010)

Scratch 1.4 (Badger, 2009)

Unit 3 Overview – Descriptive Statistics

Students assess how a model fits data more formally than they've done in previous courses. Utilizing regression techniques to describe approximate linear relationships between quantities, students use graphical representations and knowledge of the context to make judgments about the appropriateness of linear models. With linear models, they look at residuals to analyze the goodness of fit. Through the medium of music, the content of unit three integrates data collection with simulation of an online music store and application of developing a marketing brochure for the online music store that anyone on the internet can try.

To integrate this unit with ICT, after creating the simulation of the online music store and its online marketing brochure, students present data about what music is being listened to and then the program builds the scatter plot of the data. They decide what music to market based on the scatter plot. Before creating a brochure, students research musical tastes and buying habits of potential customers in their community. The brochure describes the significance of the store, pays attention to key words in short passages, and creates introduction of products. Finally, students develop the marketing brochure for an online music store for their local community.

The learning within this unit integrates two Standards for Mathematical Practice (SMP): model with mathematics (SMP 4) and use appropriate tools strategically (SMP 5). As students apply the classroom mathematics to the real life examples of predictable and unpredictable situations, they develop the connectedness of mathematics with the real life's applications. Students develop a view that mathematics approximates reality and mathematical models can guide their understanding of the world around them through understanding descriptive statistics. They gain skills of clarity and brevity, parsimony of removing irrelevant details, universality that claims must be true in all possible cases, not just most or all known cases, and objectivity by asking "why" questions and accept answers based on reason.

Major Topics

Represent data with plots on the real number line,
Use statistics to compare center and spread of two or more data sets,
Interpret differences in shape, center and spread (possible outliers),
Summarize categorical data for two categories in two-way frequency tables,
Represent data on two quantitative variables on scatter plots,
Interpret slope and intercept of a linear model in context of data,
Use technology to computer and interpret correlation coefficient of linear fit,
Distinguish between correlation and causation,
Integrate media into a full project using appropriate tools,
Create and/or capture professional-quality media and audio, and
Analyze the use of media to determine the appropriate file format and level of compression.

Resources

Inside Mathematics (Silicon Valley Math Initiative)
http://www.www.insidemathematics.org/

101 questions
http://www.101qs.com/

Heinemann-Open Ended Questions
http://books.heinemann.com/math/

Achieve the Core
http://www.achievethecore.org/

http://scratch.mit.edu

Learning to Scratch (Calder, 2010)

Unit 4 Overview – Congruence, Proof, and Constructions

Students build upon prior experience with rigid motions: translations, reflections, and rotations. They establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They solve problems about triangles, quadrilaterals, and other polygons. They apply reasoning to complete geometric constructions and explain why they work. This includes developing simple figures and performing a variety of transformations on the figures. For each new drawing, they describe the rigid motions of translations, reflections, and rotations.

To connect the content of unit four with ICT concepts, students create an animation of tessellations by using various arrays, objects, and files. It includes a rotation or reflection that should not be composed entirely of regular polygons. Two students working together, they analyze the intersections of the tessellating figures after making a portfolio which includes the following constructions: copying a segment, copying an angle, bisecting a segment, bisecting an angle, and constructing perpendicular lines including the perpendicular bisector of a line. The portfolio also contains the students' learning on a line parallel to a given line through a point not on the line, an equilateral triangle, a square, and a regular hexagon each inscribed in a circle. As students publish their animated tessellation at http: scratch.mit.edu, they integrate a variety of media such as sprites, sounds, and video. Additionally, students provide the methods they used to create the animation including key programming elements as well as transformations, tessellations, and portfolio of constructions. Students demonstrate their ability to use keyframe animation and drawing software.

This unit targets on two Standards for Mathematical Practice (SMP): look for and make use of structure (SMP 7) and look for and express regularity in repeated reasoning (SMP 8). Identifying patterns, making and testing conjectures, trying multiple representations, practicing deduction and mathematical induction, and linking to known results, students find a structure in learning diverse mathematical concepts. Through regularity in repeated reasoning, they attain confidence and fluency in handling formulas and computational algorithms, predicting approximate outcomes mentally, on paper, or with technology while deepening their conceptual understanding and procedural fluency in solving problems.

http://scratch.mit.edu/projects/Paddle2SeeFixIt/181576

Major Topics

Define geometric terms,
Transformations as functions,
Rotations and reflections that carry polygons onto themselves,
Develop definitions of transformations for specific figures,
Perform transformations,
Predict the effect of a given rigid motion,

Determine congruence as it relates to rigid motion,
Triangle congruence and rigid motion,
Criteria for triangle congruence as it relates to ASA, SAS, and SSS,
Make formal geometric constructions,
Use strategies to optimize code for improved performance,
Use arrays,
Use proper programming language syntax,
Use media design in editing software, such as keyframe animation, drawing software, and image editors,
Create an online project, and e-portfolio,
Develop an animation from storyboard to production

Resources

Math Assessment Project (MAP)/ Math Assessment Resources Services (MARS) Problems from the Shell Centre http://map.mathshell.org.uk/materials/tasks.php

Inside Mathematics (Silicon Valley Math Initiative) http://www.www.insidemathematics.org/

Smarter Balanced Test Items http://www.smarterbalanced.org/wordpress/wp-content/uploads/2011/12/Math-Content-Specifications.pdf

LEMA Project
http://www.lema-project.org/web.lemaproject/web/dvd_2009/english/teacher.html

Modeling Problems at COMAP
http://www.mathmodels.org/problems/

http://scratch.mit.edu

Learning to Scratch (Calder, 2010)

Scratch 1.4 (Badger, 2009)

Unit 5 Overview – Connecting Algebra and Geometry through Coordinates

Students build depth of knowledge upon their prior understanding of finding distance using Pythagorean Theorem with a Cartesian coordinate system to verify Geometric relationships, including properties of special triangles, quadrilaterals, circles, and slopes of parallel and perpendicular lines, as well as areas and perimeters of polygons.

For the ICT connection, students create a program that allows users on the Internet to play a tangram puzzle game. Students publish a tangram puzzle game that they programmed at http://scratch.mit.edu. As students provide the methods they used to create the puzzle game including key programming elements, they test the functionality of the program by using algebraic and geometric coordinate points, knowing elements of puzzle design, understanding the process of creating a game, and designing player actions.

Throughout this unit, students communicae their reasoning, demonstrate conceptual and procedural fluency, find examples of connecting Algebra and Geometry through coordinates in real life contexts by applying the elements of mathematical modeling, and become patient problem solvers. They practice and demonstrate all eight Standards for Mathematical Practice:

1) make sense of problems and perserve in solving them, 2) reson abstractly and quantitatively, 3) construct viable arguments and critique the reasoning of others, 4) model with matheamtics, 5) use appropriate tools strategically, 6) attend to precision, 7) look for and make use of structure, and 8) look for and express regularity in repeated reasoning.

Major Topics

Geometric relationships,
Slope of parallel and perpendicular lines,
Properties of polygons and properties of circles,
Perimeter and area of polygons, circumference, and circles,
Analyze how simulations can educate,
Take a project from development to completion,
Maximize interactivity with an online project,
Develop a presentation or other multimedia project: video, game, and/or interactive websites,
Analyze the use of media to determine the appropriate file format and level of compression,
Integrate media into a full project using appropriate tools,
Know elements of puzzle design,
Use key strategic considerations in game design,
Understand the process of creating and designing player actions,
Understand strategic outlining in game designs,
Know elements of puzzle design,
Use key strategic considerations in game design, and
Understand the process of creating and designing player actions.

http://scratch.mit.edu/projects/ahaanomegas/601498

Resources

Ehow – http://www.ehow.com/how_5562560_use-legal-property-description-location.html
This is a free online website that is used to explain and help a land map (township)

Math Assessment Project (MAP)/ Math Assessment Resources Services (MARS) Problems from the Shell Centre http://map.mathshell.org.uk/materials/tasks.php

Inside Mathematics (Silicon Valley Math Initiative)
http://www.www.insidemathematics.org/

Smarter Balanced Test Items
http://www.smarterbalanced.org/wordpress/wp-content/uploads/2011/12/Math-Content

Achieve the Core
http://www.achievethecore.org/

National Library of Virtual Manipulatives
http://nlvm.usu.edu/en/nav/category_g_2_t_2.html

Graphing Calculator
https://www.desmos.com/

Geogebra
http://www.geogebra.org/cms/

Statistics
http://www.census.gov/

http://www.nasa.gov

http://scratch.mit.edu

Learning to Scratch (Calder, 2010)

Scratch 1.4 (Badger, 2009)

Key Assignments: *Detailed descriptions of all Key Assignments which should incorporate activities and projects, as well as, short answers and essay questions. How do assignments incorporate topics? Include all assignments that students will be required to complete. Assignments should be linked to components mentioned in the course outline and in the discussion of accomplishing the course goals. Explicitly indicate how the assignments support the eight Standards of Mathematical Practice in the Common Core State Standards. Courses must address them all in a balanced fashion. It is not appropriate or necessary to include instructions given to students regarding the execution of assignments (formatting, timeliness, etc.). Do not include exams or assessments in this section.*

Key Assignments

Unit 1 – Reasoning with Linear Equations and Inequalities

Task 1 – Road Trip Fuel Efficiency
Students examine and calculate the fuel cost of a road trip to a destination of their choice using the fuel efficiency of a particular vehicle and a given cost of gasoline. Additionally, they compare the cost of the same trip using a different vehicle.

Task 2 – Pair Developed Systems of Equations on Long Term Cost Difference
In pairs, each student formulates a linear equation and creates a graphic representation to model a solution by analyzing and comparing the long term cost difference between buying a used car for a randomly assigned cash value or applying that cash amount as a down payment on a new car. Students combine this into system of equations, analyze the system, and summarize it.

Task 3 – Long Terms Costs
Students factor monthly payments, maintenance, registration, and insurance into the long term costs associated with each vehicle over a period of 1, 3, and 5 years. After that, they build a system of equations to represent these costs as a function of cost over time. Then, they create a visual display including a representation of the solution to each system graphically and algebraically.

Task 4 – Programming that Simulates a Car Purchase
To integrate the mathematics key assignments with ICT, a mathematics teacher guides students in creating a culminating assignment. Tasks 1, 2, and 3 prepare students to gain conceptual and procedural fluency on linear equations and equalities; at the same time, task 4 supports student learning by integrating ICT standards with mathematics. Students create a program that simulates a car purchase by identifying the objectives of the program. Using Scratch, they create a program, so the user goes through a simulated car purchase. They choose a new car and an old car. Students integrate sprites as a media into the project. There are different ways to insert media into projects. Students identify which media fits best. They look at file size compared to image quality. The purchase price varies between the used and new car. Most importantly, the program allows the user look at purchasing options. In programming, the formulas for the used and new car will be similar. Students need to see the similarities in the two formulas and optimize

the code for improved performance. Using variables and formulas, the students program a simulated interest rate, purchase price, down payment, and trade in. The variables and formulas will not work at first even though the students have planned for them to work. By testing the program, bugs present in the program become evident and are worked out for the sake of the quality assurance process. The end user compares the purchase of a new car compared to the purchase of an old car. After completing the simulated car purchase, students add the elements of cost of ownership. Their simulation adds in the costs of monthly payments, maintenance, registration, and insurance. To measure the effectiveness of the completion of the program, students evaluate their learning based on the criteria of the assignment.

<u>Task 5 – Website</u>
Using Google Apps for Education, students begin an electronic portfolio that continues through the entire course. Before students are asked to create the portfolio, students are guided through a step-by-step instruciton on how to use the Google Apps for Education. Building upon this Google Apps' scaffolded understanding, students construct their portfolio and present it, while developing the skills to design an effective and intuitive interface for people visiting their site. Working on their site allows the possibility of student creativity to be demonstrated in various ways. The portfolio contains a link to their program for the end user, a link to the actual coding, and a link responding to prompts provided by the teacher. Getting students used to Google Apps for Education prepares them for college by linking student learning with real life applications. UC and CSU colleges are using Google as a preferred way of communication. Introducing Google Apps in this course supports students comfortable with navigating and using this online environment. Creating and maintaining a Google site allows the students to articulate the problem solving process as they complete this assignment.

Prompt 1: What are the benefits of using equations to help purchase a car?
Prompt 2: What are other purchases you make in life that require you to use equations?
Prompt 3: What process did you go through to discover the correct equation in simulating a car purchase?
Prompt 4: Evaluate the results of your program against the initial requirements of creating a simulated car purchase of a new or used car along with the long term costs.

<u>Unit One's SMP Connection</u>
While working on key assignments, students practice two Standards of Mathematical Practice (SMP): make sense of problems and persevere in solving them (SMP 1) and attend to precision (SMP 6). Students develop a view that learning mathematics is a sense making process which is much more than just a collection of definitions, algorithms, and memorizing theorems. At the same time, students develop the value of precision of reasoning with linear equations and inequalities of understanding mathematics.

<u>Skill Practice sets from State Approved Algebra 1 Textbook & Homework Assignments</u>
Students complete daily practice sets from the approved textbook to promote automaticity of procedural knowledge for creating equations and inequalities, solving equations in one variable, solving systems of linear equations, and interpreting graphs. In order to promote procedural fluency and conceptual understanding, students complete daily homework assignments. The daily homework assignments prepare students in working on rigorous and relevant tasks and culminating integrated key assignment of this unit. Another layer of homework assignment includes commenting on their Google Site about prompts and responding and asking questions to their peers' postings.

<u>Unit 2 –Linear and Exponential Relationships</u>

<u>Task 1: Research</u>
Students research the differences of motion (train and airplane) vs. projectile motion through

various websites by connecting the linear and exponential relationships with real life examples in predictable situations. They also research to find examples of linear and quadratic examples and functions in order to connect the classroom mathematics to the contexts of everyday life.

Task 2: Summarize and Simulate Differences of Motion

Students summarize and simulate their findings by identifying the differences and similarities between linear and exponential functions. Students draw conclusions on its importance in real life's predictable situations.

Task3: Creating a Simulation of Linear and Exponential Functions

To integrate unit two's math content with ICT, students create functions that work for a simulation to apply mathematics through the platform, Scratch. Students tackle linear and parabolic motion in tasks 1 and 2. By creating a simulation in task 3 that puts a train's linear motion in comparison to an airplane's parabolic motion, students compare the speed the airplane needs to travel in order to overcome the added distance of flying through the air. Students work in teams of two. One student works on the airplane's motion while the other works on the train's motion. Before beginning the program, students identify the core tasks and challenges that they face in creating this simulation. Programmers usually work on teams in their careers. Working on a small team prepares students to experience real life collaboration in problem solving. They calculate minimum and maximum values, zeros of quadratic functions, and apply them in writing a program. By identifying and using different authoring tools, students apply the basic processes of input, processing, and output. Students identify what inputs are needed to correctly process accurate outputs.

Task 4: Presentation of the Simulation on Linear and Exponential Relationships

Students present the simulations to the class that includes their research, findings, conclusions, and the overall assignment. The assignment is to be evaluated by a rubric that is student-generated and teacher-agreed. The final score is to be justified by students justifying their grades based on the rubric and evidence-based explanations.

Task 5: Website

Using Google Apps for Education from unit one, students continue constructing their electronic portfolio by working on the following prompts:

Prompt 1: Why is a discussion of the domain and range of functions more interesting once students have learned about quadratic and other exponential functions?
Prompt 2: As an experienced simulator of traveling via a train and plane, what advice would you have for an airplane company?
Prompt 3: Why is this information important to airlines?
Prompt 4: What advice do you have for programmers when they work collaboratively?
Prompt 5: Evaluate the results of your program against the initial requirements of checking the speed and time it takes for a train and airplane to reach a destination.

Unit Two's SMP Connection

While working on creating a simulation of linear and exponential functions, students practice two Standards of Mathematical Practice (SMP): reason abstractly and quantitatively (SMP 2) and construct viable arguments and critique the reasoning of others (SMP 3). Students develop a gradual and natural propensity to put time and thought into using mathematics to grasp and solve unfamiliar problems by stating assumptions, definitions, and previously established results in constructing arguments. By justifying their conclusions, communicating them to others, students analyze situations by breaking them into apart as well as putting them together the relationships of linear and exponential functions.

Skill Practice sets from State Approved Algebra 1 Textbook & Homework Assignments

Students complete daily practice sets to reinforce their procedural problem solving for graphing linear and quadratic and exponential functions and labeling, writing functions, and writing arithmetic and geometric sequences. Homework reinforces concepts and skills students develop during class time. Homework consists of worksheets and problems from the text which is assigned daily. In order to promote procedural fluency and conceptual understanding, students complete daily homework assignments. The daily homework assignments prepare students in working on rigorous and relevant tasks and culminating integrated key assignment of this unit. Another layer of homework assignment also includes commenting on their Google Site about prompts and responding and asking questions to their peers' postings.

Unit 3 –Descriptive Statistics

Task 1 – Radio Stations
Students make a list of all the radio stations that broadcast in an area, record each station's call letters, its number, whether it is AM or FM, and its category, such as country, top 40, classical, oldies, gospel, news/talk, and so on. Students use several types of data displays to look at different aspects of the information they collected. They plan what to sell in their music store by making a list with the following the prompt, "How can you use your displays to help you plan what to sell in your music store?"

Task 2 – Collecting Data
Working in groups of three to four, students create a survey to gather data on age, family income, cultural background, and type of music purchased and how many music recordings they purchased last year. Students create a two-way frequency table and display the data for age and type of music purchased.

Task 3 – Fit of a Function
Using a scatterplot, students display the data for family income and number of recordings purchased. Students summarize the data and informally assess the fit of a function by analyzing the residuals. Fitting a function to the data and comment on the strength of the relationship, students interpret the slope and the intercept by measuring what the effects of a steeper slope.

Task 4 – Top Ten Music
Find out how data are collected for making a Top Ten music, movie, or book list. Students research on who supplies the data, whether any formulas are used, write a summary of how the list is determined. In doing this research on the data collection, they suggest how changes in the process could produce different results.

Task 5 – Developing a Marketing Brochure for an Online Music Store
Students develop a marketing brochure for an online music store for their local community. Before creating the brochure, students research musical tastes and buying habits of potential customers in their community. The brochure describes the significance of the store, pays attention to key words in short passages, and creates introduction of products. Students apply collected data to market the most appropriate music to the community. During the completion of this task, students apply the mathematics they know to solve problems in everyday life (SMP 4, model with mathematics) when developing a business brochure and seek to use appropriate tools strategically (SMP 5).

Task 6 – Creating an Online Music Store Simulation
Students create a simulated online music store based on the data that was collected during tasks 1 through 4. The program used to output the simulation includes variables that are given value from the previous tasks. Once the variables are populated, a store is produced showing which music would be sold through the simulation. This gives the end user the information about which music would sell well. Through the simulation the end user can click and sample a style of music.

There are several different audio files that could be used. Students need to analyze different audio files to determine the appropriate file format for the project. Pursuing web design or game production at the school or in their future college, students also develop skills to be career ready by knowing which files work best for online websites and game production. Once the appropriate audio files are selected, students integrate audio files into the simulation. When a type of music is clicked the audio file plays. Students capture quality audio using Microsoft Sound Recorder. They examine the different audio options and decide between file size and audio quality which is best.

Task 7 – Website

Using Google Apps for Education from units one and two, students continue constructing their electronic portfolio by working on the following prompts:

Prompt 1: Based on this unit's key assignment, when developing a marketing brochure for an online music store in the future, what would you do differently?

Prompt 2: How would you solve your problems differently when creating an online simulated store?

Prompt 3: Evaluate the results of your program against the initial requirements of using the data collected in creating an online music store. How would the program you created help you design a real life store?

Unit Three's SMP Connection

While working on the assignments, students practice two Standards for Mathematical Practice (SMP): model with mathematics (SMP 4) and use appropriate tools strategically (SMP 5). As students apply the classroom mathematics to the real life examples of predictable and unpredictable situations through various assignments of Radio Stations, Collecting Data, Fit of a Function, Top Ten Music, Creating an Online Music Store Simulation, and Developing a Marketing Brochure, students develop the connectedness and applications of mathematics with the real life. Students develop a view that mathematics approximates reality and mathematical models can guide their understanding of the world around them. They gain skills of clarity and brevity, parsimony of removing irrelevant details, universality that claims must be true in all possible cases, not just most or all known cases, and objectivity by asking "why" questions and accept answers based on reason.

Skill Practice sets from State Approved Algebra 1 Textbook & Homework Assignments

In order to promote procedural fluency and conceptual understanding, students complete daily homework assignments. The daily homework assignments prepare students in working on rigorous and relevant tasks and culminating integrated key assignment of this unit. This includes commenting on their Google Site about prompts and responding and asking questions to their peer's postings.

Unit 4 – Congruence, Proof, and Constructions

Task 1 – Transformations

Students develop a simple figure and perform a variety of transformations on that figure. For each new drawing, they describe the transformation. After performing each transformation in isolation, they duplicate the design a number of times and create a larger design. Students describe what transformations occurred with each duplication (such as the design was duplicated 6 times, each rotating 60 degrees about the origin).

Task 2 – Tessellations

Students create a tessellation. The tessellation includes a rotation or reflection that is not composed entirely of regular polygons. Students get in groups with their completed tessellations

and analyze the intersections of the figures for each project. Groups report out their findings to the class as a whole.

Task 3 – Portfolio of constructions
Students make a portfolio which includes the following constructions: copying a segment, copying an angle, bisecting a segment, bisecting an angle, constructing perpendicular lines including the perpendicular bisector of a line. The portfolio also contains the concepts about a line parallel to a given line through a point not on the line, an equilateral triangle, a square, and a regular hexagon each inscribed in a circle.

Task 4 – Publish an Animation of a Tessellation
Students take the tessellation they created in task 2 and recreate the same tessellation in Scratch. Through their program the tessellation will be drawn. Students publish an animated tessellation at http://scratch.mit.edu. Providing the methods they used to create the animation including key programming elements, students apply transformations, tessellations, and portfolio of constructions. Students demonstrate their ability to use key-frame animation and drawing software. Creating a tessellation is a matter of identifying the loops in the program. Students shouldn't create every step of the animation. They need to identify which part needs to be looped. Finding the part that needs to be looped, students optimize their code for improved performance. Students use arrays in their program to create an effective tessellation. One important part of this project analyzes their coding ability to see what improvements can be made in their coding by constructing an animated tessellation. In doing so, students gain knowledge and skills related to critical thinking and creativity that connects to career and college readiness.

Task 5 – Website
Using Google Apps for Education from units one, two, and three, students continue constructing their electronic portfolio by working on the following prompts:

Prompt 1: Think about the world around you, where do you find real-life examples of congruence, proof, and constructions?
Prompt 2: Where would the keyframe animation be useful in a movie?
Prompt 3: Evaluate the results of your program against the initial requirements of designing a tessellation.

Task 6 – Evaluation for Self and Others
Students look for and express regularity in repeated reasoning (SMP 8) as they publish their programmed animation. They provide feedback on other student's work, while they assess their own performance based on a rubric. Peer evaluation is based on a rubric of clarity, precision, and creativity.

Unit Four's SMP Connection
As students work on key assignments of transformations, tessellations, portfolio of constructions, they publish an animation of a tessellation and evaluate the performance of the key assignments for self and others. They practice two Standards for Mathematical Practice (SMP): look for and make use of structure (SMP 7) and look for and express regularity in repeated reasoning (SMP 8). Identifying patterns, making and testing conjectures, trying multiple representations, practicing deduction and mathematical induction, and linking to known results, students find a structure in learning diverse mathematical concepts. Through regularity in repeated reasoning, they attain confidence and fluency in handling formulas and computational algorithms, predicting approximate outcomes mentally, on paper, or with technology while deepening their conceptual understanding and procedural fluency in solving problems

Skill Practice sets from State Approved Algebra 1 Textbook & Homework Assignments
Students complete daily practice sets from the approved textbook to promote automaticity of

procedural knowledge in identifying and performing transformations, determining congruence of triangles, and performing geometric constructions. In order to promote procedural fluency and conceptual understanding, students complete daily homework assignments. The daily homework assignments prepare students in working on rigorous and relevant tasks and culminating integrated key assignment of this unit. This includes commenting on their Google Site about prompts and responding and asking questions to their peer's postings.

Unit 5 –Connecting Algebra and Geometry through coordinates

Task 1 – Tangram Proof
Students prove a series of teacher selected properties and/or theorems of polygons. Proofs will be explained in narrative form and supported by 9 pieces of tangram using algebraic and geometric terms. Students will create their own paper tangrams. They will identify geometric shapes, parallel and perpendicular lines, properties of polygons, properties of circles, and perimeter and area of polygons.

Task 2 – Cartography
By using nine pieces of tangram shapes, students design and create a land map consisting of one township (see resources: "how to locate a property from a legal property description"). Land maps are to be labeled using a Cartesian coordinate system. Students determine the dimensions (acreage) of selected properties that are made of nine tangram shapes and give the property description of that parcel of land. Additionally, as a peer evaluation, students exchange property descriptions with two other students. Students are required to find the perimeter and area of each of the two properties (in feet).

Task 3 - Program and Publish a Puzzle Game: Tangram
Students publish a tangram puzzle game that they programmed at http://scratch.mit.edu. Through the experience and knowledge they gained about tangrams from task 1, they are prepared to create a puzzle game in Scratch. Students design a game that is both interesting and challenging. They look at the puzzle of tangrams as a game and come up with a strategic outline for the game design. The game handles several complex movements like location, rotation, and interacting with other objects. Precise movements have to be checked by the program, so pieces interact with each other. Programming in college and technology careers values precision and accuracy.

Task 4 – Website
Using Google Apps for Education from units one, two, three, and four, students continue constructing their electronic portfolio by working on the following prompts:

Prompt 1: Think about the world around you, where do you find real-life examples of the connection of Algebra and Geometry through coordinates?
Prompt 2: How would you summarize your understanding about the course, Integrated Mathematics One and Information and Communication Technologies?
Prompt 3: Evaluate the results of your program against the initial requirements of designing a tangram puzzle game.

Unit Five's SMP Connection
Working on key assignments, students communicae their reasoning, demonstrate conceptual and procedural fluency, find examples of the Integrated Math 1 concpets in real life contexts by applying the process of mathematical modeling, and become patient problem solvers. Regulating their learning, students demonstrate all eight Standards for Mathematical Practice: 1) make sense of problems and perserve in solving them, 2) reson abstractly and quantitatively, 3) construct viable arguments and critique the reasoning of others, 4) model with matheamtics, 5) use appropriate tools strategically, 6) attend to precision, 7) look for and make

use of structure, and 8) look for and express regularity in repeated reasoning.

Skill Practice sets from State Approved Algebra 1 Textbook & Homework Assignments

In order to promote procedural fluency and conceptual understanding, students complete daily homework assignments of the chapter and unit practice sets from the adopted textbook. The daily homework assignments promote students' automaticity of procedural knowledge. At the same time, it increases their conceptual understanding through rigorous and relevant tasks; gradually, working on the assignments support students to culminate in integrating the learning of this unit. Another layer of homework assignment includes commenting on their Google Site about prompts and responding and asking questions to their peer's postings.

Instructional Methods and/or Strategies: *Indicate how the Instructional Methods and/or Strategies support the delivery of the curriculum and the course goals. Explicitly indicate how the instructional approaches support the eight Standards of Mathematical Practice in the Common Core State Standards. Courses must address them all in a balanced fashion. What portions of the Course Outline are supported by the methods and strategies?*

Instructional Methods and Strategies

The following instructional methods and/or strategies are used in units one through five. For each unit and lesson, the eight Standards of Mathematical Practice (SMP) are explicitly indicated and taught as a way of learning problem solving skills through the content areas of mathematics and ICT. The eight standards include the following elements: 1) Make sense of problems and persevere in solving them, 2) Reason abstractly and quantitatively, 3) Construct viable arguments and critique the reasoning of others, 4) Model with mathematics, 5) Use appropriate tools strategically, 6) Attend to precision, 7) Look for and make use of structure, and 8) Look for and express regularity in repeated reasoning.

Cognitively Guided Instruction (CGI)

Cognitively Guided Instruction is an instructional process that helps students to generate and validate new concepts and procedures as they engage in justifying and explaining various mathematics concepts and procedures. Students develop as self-regulating learners as a teacher functions as the facilitator of a lesson: 1) start the study of a new concept with a rich problem or hypothesis, 2) invite students to engage in the problem, 3) communicate multiple representations of solutions, 4) question, justify, and critique thinking, and 5) use student thinking and understanding to guide further instruction.

The CGI process is used in units one through five when facilitating the lesson and introducing the key assignments or assessments. A teacher functions as a facilitator to guide student thinking and learning by preparing a lesson with a rich problem that has a real life connection. The teacher invites students to engage in the problem solving process by asking open-ended questions to seek for an entry point. As the teacher scaffolds students' problem solving process by encouraging students to use multiple representations and scaffolds the questions in order to shift students' thinking from low to high level of Depth of Knowledge (DOK), the teacher guides discussions by having students justify their thinking and critique one another's reasoning to understand the problem and find its solutions in making sense of the problem.

The CGI process supports the first Standards of Mathematical Practice (SMP): **make sense of problems and persevere in solving them** (SMP 1) by encouraging students to start by explaining to themselves and to their peers about the meaning of a problem and looking for entry points to its solution. Teacher guides students to think and analyze givens, constraints, relationships, and goals. With the CGI's guided process, students are likely to make conjectures about the form and meaning of their solutions and plan a solution pathway.

Project-Based Learning (PBL)

In order to support students to be self-directed learners who can self-manage, self-monitor, and self-modify and ensure that students can transfer the learned skills and knowledge to all aspects of their life, PBL integrates classroom activities, content standards, and habits of mind. The classroom activities, such as reading a chapter, having a discussion, and building a model begin with the question, “What will students do as part of this lesson or project?” To connect the concepts that come from the heart of the discipline and align to state standards and assessments, the content standards of PBL nudge teachers to plan with a question, “What concepts do I want students to understand?” To instill the habits of mind of flexibility in thinking, managing impulsivity, metacognition, and persistence, teachers plan and teach with the question, “Which habits of mind do I want students to develop?”

The key PBL components three phases: project design, project implementation, and project assessment. The project design includes a purposeful planning for simultaneous outcomes, mapping to standards, and inclusion of six A’s of PBL. The project implementation utilizes the nine steps of Marzano’s high yielding strategies. Lastly, the project assessment is to consider the learning community within the real-world context by focusing on products and performances, feedback strategies, and authentic audiences.

The six A’s of designing projects constitute a powerful list of features: authenticity, academic rigor, applied learning, active exploration, adult relationships, and assessment practices. The PBL also emphasizes the components of nine high yielding strategies promote understanding in learning mathematics and across all content areas for all grade levels: 1) identifying similarities and differences, 2) summarizing and note taking, 3) reinforcing effort and providing recognition, 4) homework and practice, 5) nonlinguistic representations, 6) cooperative learning, 7) setting objectives and providing feedback, 8) generating and testing hypotheses, and 9) cues, questions, and advance organizers. Used in units 1-5

While learning with the PBL approaches, students **look for and make use of structure** (SMP 7) by looking closely to discern a pattern or structure of project-based learning. They recognize the significance of project that relates to each concept and make adjustments of mathematics and ICT content by stepping back for an overview and shift perspectives while exercising flexibility and adaptability.

<u>Questions that Focus on Rigorous and Relevant Learning</u>

Based on Common Core’s rigor and relevance framework, four levels of questions are organized into four quadrants: A) Acquisition, B) Application, C) Assimilation, and D) Adaptation. In order to promote students’ communication and critical thinking skills by utilizing a set of questions within each quadrant, a teacher purposefully ask the following questions in increasing students’ depth of understanding from recall to concept and skill, to strategic thinking, then to extended thinking.

The quadrant A questions ask students to recall facts, make observations or demonstrate understanding:

- What did you observe__?
- What else can you tell me__?
- How would you define that in your own terms?
- What did/do you notice about this__?

The quadrant B questions ask students to apply or relate:

- How would you do that?
- Where will you use that knowledge?
- How can you demonstrate that?
- What observations relate__?
- Where would you locate that information__?
- How would you collect that data__?
- How do you know it works?
- Can you apply what you know to this real world problem? How?

The quadrant C questions ask students to summarize, analyze, organize, or evaluate:

- How are these similar or different?
- What's another way we could say/explain/express that?
- What is a better solution to__?
- What changes to __ would you recommend?
- What evidence can you offer?
- How do you know?

The quadrant D questions ask students to predict, design, or create:

- How would you design a __ to __?
- How would you compose a song about__?
- What is a possible solution to__?
- How could you teach that to others?
- Which resources would you use to deal with__?
- How would you devise your own way to deal with__?

The questions create multiples opportunities for students to practice the SMP 2, 3, and 8: **reason abstractly and quantitatively, construct viable arguments and critique the reasoning of others**, and **look for and express regularity in repeated reasoning**. These questions can be utilized during the cognitive guided instruction and direct instruction in scaffolding students' thinking and learning. The shifting of quadrant A questions to quadrant B, to C, or to D, a teacher helps students to think at a higher level of Bloom's taxonomy. Often using these questions as sentence starters and sentence frames helps English Learners, Students with Disabilities, and other students in articulating their thinking and reasoning process.

Direct Instruction

Direct instruction is a lesson delivery method that includes teacher-directed instructions, as well as modeling of the essential skills and concepts. It includes five phases: orientation, presentation, highly structured practice, guided practice, and independent practice. Students take notes using either a graphing organizer or Cornell-note taking process, continually referring back to their notes to build on their prior knowledge. Used in units 1-5.

For the SMP connection, students **use appropriate tools strategically** (SMP 5) by considering the available tools when solving a mathematical problem. These tools include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, a dynamic geometry software, or an technology device.

Explicit Direct Instruction(EDI)

Explicit direct instruction supports teachers to be mindful of explicit lesson design components and delivery techniques. The EDI's lesson design components include three phases of student preparation of learning objective(s) and activate prior knowledge, content delivery of concept development, skill development, importance development, guided practice, and closure, independent work of independent practice, homework, and periodic review. In addition, the lesson delivery techniques include the following: checking for understanding, differentiating strategies, active participation, cognitive strategies, teaching strategies of modeling, explaining, and demonstrating, English Learner strategies, intervention, and remediation. Used in units 1-4.

To integrate with the SMP, students **look for express regularity in repeated reasoning** (SMP 8) by noticing if calculations are repeated, and look both for general methods and for shortcuts. As students work to solve a problem, mathematically proficient students maintain oversight of the process while attending to the details. Students continue to evaluate the reasonableness of their intermediate results.

K-W-L (Know, Want to Know, Learned)

The KWL is a note-taking technique that activates students' prior knowledge, sets goals for learning and

reflects on what was learned. Students generate their background knowledge by filling in the ‘know’ column with everything they already know about the topic. The ‘want to know’ column is used to predict what students might learn, or set goals about what they want to learn. After the material is presented, the last column ‘learned’ is filled out with new knowledge. Used in units 1-5.

For K-W-L, students write their ideas in order to **construct viable arguments and critique the reasoning of themselves and others** (SMP 3) by analyzing situations by breaking them into smaller chunks and justifying their conclusions after reasoning inductively and deductively about their own awareness.

Communicating Reasoning through Sentence Starters

For English Learners and English Only students, often using sentence starters helps students to scaffold their thinking and speaking by providing starter phrases. The sentence starters support students to express an opinion, predict, ask for clarification, paraphrase, solicit a response, acknowledge ideas, report a partner’s idea, report a group’s idea, disagree, offer a suggestion, affirm, and hold the floor. By posting posters with the phrases with explicit modeling and use of the sentence starters frequently, students are likely to increase their oral fluency.

The following phrases can create a learning environment that promotes reasoning and critical thinking:

- Expressing an Opinion (I think/believe that…, It seems to me that…, In my opinion…),
- Predicting (I guess/predict/imagine that…, Based on…, I infer that…, I hypothesize that…),
- Asking for Clarification (What do you mean? Will you explain that again? I have a question about that),
- Paraphrasing (So you are saying that… In other words, you think… What I hear you saying is…)
- Soliciting a Response (What do you think? Do you agree? What answer did you get?)
- Acknowledging Ideas (My idea is similar to ___’s idea. I agree with ___that…. My idea builds upon ___’s idea.)
- Reporting a Partner’s Idea (___ indicated that…, ___pointed out to me that…, ___emphasized/concluded that…),
- Reporting a Group’s idea (We decided/agreed that… We concluded that… Our group sees it differently. We had a different approach.),
- Disagreeing (I don’t agree with you because… I got a different answer than___. I see it another way),
- Offering a suggestion (Maybe we could… What if we… Here’s something we might try…),
- Affirming (That’s an interesting idea… I hadn’t thought of that… I see what you mean…), and
- Holding the floor (As I was saying… If I could finish my thought… What I was trying to say was…).

Using sentence starters support students to **construct viable arguments and critique the reasoning of others** (SMP 3), students articulate their thoughts on making conjectures and building a logical progression of statements to explore the truth of their conjectures. By responding to the arguments of others, justifying their conclusions, and communicating them to others, they develop the language proficiency with the content specific essential vocabulary.

Discussion

A discussion is a verbal exploration of a topic. To increase student achievement, frequent opportunities to generate and share questions should be made available to students. The purpose of a small-group or whole class discussion is to help students make sense of the material, to stimulate thought, to explore, to reflect, to provide opportunities, to clarify and expand their ideas, to support positive group interaction, and to demonstrate good questioning techniques. The discussions in this course are either online postings or live in-class discussions.

The discussion as an instructional strategy in units 1 through 5, a teacher helps students to seek entry points of a problem solving process. In the middle of guiding students thinking through cognitively

guided instruciton or direct instruction, the discussion is used to help the teacher to measure students' thinking and learning as well as students understanding each other's arguments and reasoning. To lead the discussion, utilizing the questions that focus on rigorous and relevant learning of quadrant A, B, C, and D can make a positive difference in students' understanding.

Students practice to **make sense of problems and persevere in solving them** (SMP 1) by checking their answers to problems using an alternative method by asking themselves, "Does this make sense?"

Think, Pair, Share

This collaborative checking for understanding (CFU) strategy in which students work together to solve a problem or answer a question. This technique requires students to think individually about a topic or answer to a question, share ideas with classmates or partner, and discuss an answer with a partner serves to maximize participation. This CFU strategy assists in sustaining students' focus and attention by engaging them in comprehending the concepts.

THINK: Teacher begins by asking a specific question. Students "think" about what they know.
PAIR: Each student should be paired with another student or small group.
SHARE: Students share their thinking with a partner or group. Teacher expands share into whole class discussion. Used in units 1-5.

Students **reason abstractly and quantitatively** (SMP 2) by articulating their thoughts in making sense of quantities and their relationships in problem situations. Students exercise the ability to decontextualize a given situation and represent it symbolically and manipulate the symbols as if it has a life of its own and practice the ability to contextualize by proving into the referents for the involved symbol. Students consider the importance of units, attend to the meaning of quantities, and know different properties of operations and objects.

Group Work

Teacher assigns group tasks that encourage involvement, interdependence, and fair division of labor. All group members feel a sense of responsibility for the success of their teammates and realize that their individual success depends on the group's success. Teacher assigns different roles to the group members, so that they are all involved in the process. Knowing that peers are relying on you is a powerful motivator for group work. Used in units 1-5.

When working as a team, students apply mathematics they know to solve problems arising in everyday life, society, and the workplace (SMP 4: **model with mathematics**). Students apply what they know by making assumptions and simplify a complicated situation, realizing it might need revision later.

Peer – to – Peer tutoring

This is a method that involves students teaching other students. Students demonstrate the proficiency and mastery of the content knowledge when they are able to comprehensively teach a concept to another student. When a student is struggling, having someone who is on the same age level as them, helps to create bridges in the learning gaps. Peer tutoring gives students more opportunities to talk about what they are learning, to practice and to ask questions when they are confused, without fear of being embarrassed in front of the whole class. Used in units 1-5.

Students practice using **appropriate tools strategically** (SMP 5) in identifying relevant external mathematical resources in order to explain concepts to their peers.

Active Listening

The active listening involves the student (listener) checking in with the speaker (teacher) through paraphrasing and questioning in order to verify that he or she has understood what is being said. Active listening improves students' listening skills by having them ask themselves, "Does this make sense?" Students are likely to understand the approaches of solving problems and identify correspondences

between different approaches. As a result of learning mathematics as a sense making process by actively listening, students look closely to discern a pattern or structure. Used in units 1-5.

During the active listening phases, students **make sense of problems and persevere in solving them** (SMP 1) and **look for and make use of structure** (SMP 7) by breaking apart numbers and expressions and chunking them together to shift their perspectives of mathematical and ICT understanding.

Cooperative Learning

Cooperative Learning helps students to develop the skills of collaboration which is needed to be in the work force in the 21st century. In cooperative learning, students work in groups and develop interpersonal, communication, conflict resolution and group decision-making skills. The cooperative learning groups consist of two to six members. Group members take on various roles in order to help the group accomplish tasks faster and more efficiently. Students take turns with different roles throughout the course. Used in units 1-5.

Collaboratively, students **attend to precision** (SMP 6) by communicating precisely to others by using clear definitions in discussing with others and in their own reasoning. In addition, students **use appropriate tools strategically** (SMP 5) when solving a mathematical problem and employ multiple representations to understand the problem. Various technology tools become an important medium to explore and deepen their understanding of concepts.

Guided Practice

As an instructional strategy, guided practice usually follows modeling. The instructor models how to solve the problem and then provides opportunities for students think semi-independently through a guided practice process and monitors the students on solving different problems. This could also be called "I do, you do" The teacher models a problem solving procedure; then, the students practice the problem using guided practice. This gives the instructor the opportunity to see common errors the students are making before they are given an assignment to complete independently. Used in units 1-4.

Guided practice helps students to **look for and express regularity in repeated reasoning** (SMP 8) by maintaining oversight of the process while attending to the details. Evaluating the reasonableness of intermediate results, students look for both for general methods and for shortcuts in solving problems.

Collaborative Team Teaching

The integrated approach of teaching Math and CTE standards, both teachers co-labor to form a cross-disciplinary team to share instructional time, resources, and materials to demonstrate the interconnectedness of the content areas. This approach causes both teachers to align their common goals and objectives of the overall course outcomes. Used in units 1 -5.

Teachers practice all eight Standards for Mathematical Practice as they plan, teach, assess, and reflect collaboratively: 1) Make sense of problems and persevere in solving them, 2) Reason abstractly and quantitatively, 3) Construct viable arguments and critique the reasoning of others, 4) Model with mathematics, 5) Use appropriate tools strategically, 6) Attend to precision, 7) Look for and make use of structure, and 8) Look for and express regularity in repeated reasoning.

Digital Interactive Student Journals

Interactive student journals contain all of the notes, classwork, homework and written reflections that students do throughout the year. Each day, students start an entry with the date and warm-up and include any worksheet, sketches, and reflections that they do. The journal contains a table of contents and students write comments or questions to the teacher, and the teacher responds. As interactive journals are collected, they are reviewed and graded on a regular basis. The intent of this ongoing assignment is to use the journal throughout the course and after the course as a reference. As they progress to subsequent math and/or computer programming courses, they can use the journal to review key concepts and facts through the following free online weblogs, such as http://www.mybigcampus.com

or www.edmodo.com. Used in units 1-5.

Students practice SMP 1, 3, & 4 by **making sense of problems and persevere in solving them** (SMP 1) by checking answer to problems, **construct viable arguments and critique the reasoning of others** (SMP 3) and reason inductively about data while making plausible arguments that take into account the context from which the data arose, and **model with mathematics** (SMP 4) to apply the classroom mathematics they know to solve problems arising in everyday life's predictable and unpredictable situations.

Cornell Note-taking Strategies

The Cornell method provides a systematic format for condensing and organizing rhetorical notes. Students learn the process of taking Cornell Notes and use this format throughout the course. The students divide the paper into two columns. Notes from a lecture or other presentation are written in a two column format where students indicate key words, concepts, and essential questions in the left column and notes and examples in the right. Students write a brief summary at the bottom of each lesson to increase understanding of the topic. When reviewing the material, the students can cover up the note-taking column (right column) to answer the questions or identify the keywords in the left column. Students reflect on the material and review the notes regularly. Used in units 1-5.

Through the Cornell Note-taking strategies, students develop a habit of **attending to precision** (SMP 6) in order to communicate precisely to themselves and others when articulating their own reasoning. At the same time, students **look for and make use of structure** (SMP 7) of note-taking to discern a pattern or structure of a concept through the writing process.

Multimedia Presentation

Students create a multimedia file for each unit and present it in class. They create the presentation in their assigned groups. They receive a detailed description of each multimedia assignment at the beginning of each unit. Students use a variety of media (i.e., animations, graphs, charts, audio, graphics, video) to present content information of each unit. Each group presents the content with a different technology (tool) to research, design, and communicate the project. After the presentation, other groups reflect and grade the presentation as a typed paragraph and turn it in. Students submit their projects via email and receive comments through a multimedia file (recorded voice of teacher) attached to their file. Also, students publish their project at http://scratch.mit.edu by explaining the steps and strategies in creating the project. The students include key programming elements, optimization of what they would do for th next version, self-evaluation to assess their own performance based on a rubric, and providing feedback on other students' work. The peer evaluation is to be based on a rubric of clarity of thought and quality, understanding of the assignment, ease of use, organization and development, command of programming language, use of standard English conventions of grammar, usage, and mechanics. Used in units 1-5.

Students practice all eight Standards of Mathematical Practice: 1) Make sense of problems and persevere in solving them, 2) Reason abstractly and quantitatively, 3) Construct viable arguments and critique the reasoning of others, 4) Model with mathematics, 5) Use appropriate tools strategically, 6) Attend to precision, 7) Look for and make use of structure, and 8) Look for and express regularity in repeated reasoning.

WICR Strategy

WICR is an acronym that stands for Writing, Inquiry, Collaboration, and Reading. The goal of this strategy is to ensure that every class period, students have the opportunity to use all four cognitive functions. Writing can occur in many ways via proposals, questions, summaries, checking for understanding, and reflections at the end of class through the interactive notebook. Inquiry is focused on critical thinking, insightful and skilled questioning, creativity, development of conjectures regarding geometric and algebraic relationships, and development of proofs and mathematical and ICT reasoning. Collaboration occurs in group projects, peer tutoring and teaching, and brainstorming. Reading refers to

both independent and in-class reading, applying effective reading strategies to comprehend information in texts and other resources. Through the reading, students connect learning to previous knowledge and skills. Students practice the SMP 1, 3, and 4: **make sense of problems and persevere in solving them and construct viable arguments and critique the reasoning of others**, and **model with mathematics**.

Assessments Including Methods and/or Tools: *Indicate the intent of each assessment and a brief description of how each relates to the Course Purpose and goals related to the development of critical thinking and other habits of mind skills as described in the eight Standards of Mathematical Practice in the Common Core State Standards.*

Assessments

In order to prepare for the upcoming changes that will begin in 2014-15, the student understanding of mathematics and ICT will be assessed formatively and summatively. Formative assessments include the unit projects, homework assignments, weekly quizzes, unit tests, and daily assessment of student learning through various forms of informal and formal checking for understanding strategies. The formative assessments include various items of constructed response and selected response to assess their conceptual and procedural fluency in problem solving. To measure students' deeper conceptual understanding, critical thinking skills, communication, and mathematical modeling which is to apply the classroom mathematics to real life , diverse lengths of performance assessments will be created, including unit projects and integrated key assessment of ICT and mathematics. Being mindful of four quadrants of rigor and relevance of Common Core State Standards, the assessments shift from acquisition, application, assimilation, to adaptation. Integrating the four quadrants of rigor and relevance with Depth of Knowledge verbs and questions, the assessments are aligned with the content of Integrated Math 1 and Information and Communication Technologies.

Homework

To create opportunities for students to assess their own learning and understanding, homework is used as a formative assessment. Homework reinforces concepts and skills students develop during class time. Homework consists of worksheets and problems from the text which promotes procedural fluency and conceptual understanding in problem solving. Utilizing constructed items that require open-ended responses, the rigor of the homework assignments shifts from low to high. Developing confidence, fluency, and positive habits of mind, the daily homework assignments reinforce the Standards for Mathematical Practice, by attending to precision (SMP 6), using appropriate tools strategically (SMP 5), reasoning abstractly and quantitatively (SMP 2), and making sense of problems and persevere in solving them (SMP 1). Used in units 1-5.

Weekly Quizzes

While developing the habits of mind, perseverance in problem solving, students are quizzed on a formative and a summative assessment at the end of each week. It includes the items of constructed response and selected response. These quizzes asses student learning and utilize its feedback for the students to plan for the next level of their learning. For the teacher, it informs and guides instruction by supporting the teacher to create opportunities to accelerate, re-teach, intervene, or remediate. Students exercise various Standards for Mathematical Practice (SMP): look for and express regularity in repeated reasoning (SMP 8), attend to precision (SMP 6), reason abstractly and quantitatively (SMP 2), and make sense of problems and persevere in solving them (SMP 1). Used in units 1-5.

Unit Tests

Students test at the end of each unit to determine mastery of key learning outcomes in programming and Integrated Mathematics One content. The unit tests serve either as formative or summative assessments. These unit tests include selected responses, constructed responses, and performance tasks. Often, these unit tests include a reflection to have students measure their own understanding on

the Standards of Mathematical Practice (SMP) by indicating one or more SMPs by justifying their reasoning and understanding of the habits of mind. Used in units 1-5.

Weblog
As a formative assessment tool, a few options of weblog, including Edmodo, will be used by students to keep track of their learning and reflection. Teacher provides feedback after each submission based on a rubric. This weblog plays an important role in assessing students' self-regulated learning by providing a place for them to write on topics assigned to them and on their own reflections on the content of Integrated Mathematics One and programming. While gaining effective habits of mind, students practice the following standards: make sense of problems and persevere in solving them (SMP 1), construct viable arguments and critique the reasoning of others (SMP 3), model with mathematics (SMP 4), use appropriate tools strategically (SMP 5), and look for and express regularity in repeated reasoning (SMP 8). Used in units 1-5.

Formative Assessments
Teachers use diverse approaches to assess student learning, including checking for understanding through random and non-random selections with and without technology, oral questioning, exit cards, stand up/sit down, hands up/hands down, thumbs up/thumbs down, five fingers/fist, and use of proximity to assess the quality of note-taking. In order to measure students' learning on Integrated Mathematics One and ICT's programming and how to apply classroom mathematics to real life's predictable and unpredictable situations through programming, students practice all eight Standards for Mathematical Practice: 1) make sense of problems and persevere in solving them, 2) reason abstractly and quantitatively, 3) construct viable arguments and critique the reasoning of others, 4) model with mathematics, 5) use appropriate tools strategically, 6) attend to precision, 7) look for and make use of structure, and 8) look for and express regularity in repeated reasoning. Used in units 1-5.

Unit 1 Integrated Project – Programming a Simulated Car Purchase

Students create a program that simulates a car purchase by identifying the objectives of the program. Using Scratch, they create a program in order for the user to go through a simulated car purchase. They choose a new car and an old car. Students integrate sprites as a media into the project. The purchase price varies between the used and new car. Most importantly the program lets the user look at purchasing options. Using variables and formulas, the student programs a simulated interest rate, purchase price, down payment, and trade in. When the user manipulates these four variables, they see the outcome on the monthly payment. The end user is able to compare the purchase of a new car compared to the purchase of an old car. In completing the simulated car purchase, students test and debug their own programs in providing assurances that the program works as required. Students look at the objectives that are created at the beginning to make sure they have completed their program.

In order to accomplish the integrated project, students' mathematical background knowledge will be assessed with the following tasks: 1) analyze and compare the long term cost difference between buying a used car for a randomly assigned cash value or applying that cash amount (in addition to an assigned interest rate) as a down payment on a new car; 2) factor monthly payments, maintenance, fuel efficiency, registration, and insurance into the long term costs associated with each vehicle over a period of 1, 3, and 5 years; 3) build a system of equations to represent these costs as a function of cost over time; 4) create a visual display including a representation of the solution to each system graphically and algebraically; 5) communicate their findings to the class. As they discuss all results and draw conclusions about the best purchase option between a new and used car, students assess their learning as they strive to persevere in making sense (SMP 1) of the integrated project and of the newly acquired knowledge and skills of mathematics and ICT.

.**Unit 2: Publication of Comparison between a Train's Linear Motion and an Airplane's Parabolic Motion**

Integrated Key Assessment of ICT & Math

To integrate unit two's math content with ICT, students create functions that work for a simulation to apply mathematics through the platform, Scratch. Students tackle linear and parabolic motion by creating a simulation that puts a train's linear motion in comparison to an airplane's parabolic motion. In addition, students compare the speed the airplane needs to travel in order to overcome the added distance of flying through the air. They calculate minimum/maximum values, zeros of quadratic functions, and apply them to writing a program. By identifying and using different authoring tools and integrated development environments (IDEs), students apply the basic processes of input, processing, and output.

Students publish their airplane/train simulation on www.scratch.mit.edu. Students provide feedback on other student's work, and self-evaluate to assess their own performance based on a rubric. To measure students' linear an exponential understanding with ICT, students are assessed on their ability to complete three tasks of research, simulation, and presentation. Additionally, students publish their feedback for other students online directly underneath their projects. This peer evaluation is based on a five- point rubric of clarity, ease of use, organization, use of standard English conventions, and creativity. As students publish the airplane/train simulation, they practice to reason abstractly and quantitatively (SMP 2) and articulate their reasoning in writing and verbally by constructing viable arguments and critiquing the reasoning of others (SMP 3).

Unit 3 – Online Music Store Simulation: Marketing Brochure

Integrated Key Assessment of ICT & Math

Students create a simulated online music store that anyone on the internet can try. Students present data about what music is being listened to and then the program builds the scatter plot. The user has to decide what music to market based on the scatter plot. Students develop a marketing brochure for an online music store for their local community. Before creating the brochure, students research musical tastes and buying habits of potential customers in their community. The brochure describes the significance of the store, pays attention to key words in short passages, and creates introduction of products. Students apply collected data to market the most appropriate music to the community. For this key assessment of ICT and Math, students apply the mathematics they know to solve problems in everyday life (SMP 4, model with mathematics) when developing a business brochure and seek to use appropriate tools strategically (SMP 5).

Unit 4 – Creating an Animation of a Tessellation

Integrated Key Assessment of ICT & Math

Students publish their animated tessellation at http://scratch.mit.edu. They provide the methods they used to create the animation including key programming elements as well as transformations, tessellations, and portfolio of constructions. Demonstrating their ability to use keyframe animation and drawing software, students provide feedback on other student's work, while they assess their own performance based on a rubric. Peer evaluation is based on a rubric of clarity, organization, precision, and creativity. Students look for and express regularity in repeated reasoning (SMP 8) as they publish their programmed animation.

Unit 5 - Programming a Puzzle Game: Tangrams

Integrated Key Assessment of ICT & Math

Students publish a tangram puzzle game that they programmed at http://scratch.mit.edu. Providing the methods they used to create the puzzle game including key programming elements, students test the functionality of the program by using geometric and algebraic coordinates, know elements of puzzle design, understand the process of creating, and design player actions. Students provide feedback on other student's work, and evaluate their own performance based on a rubric. Peer evaluation is based on a rubric of clarity, ease of use, organization, use of standard English conventions, and creativity of programming elements. As students complete the assessment, students make sense of problems and persevere in solving them (SMP 1), use appropriate tools strategically (SMP 5), and look for and make use of structure of games and simulation pathway. While working on this project, students make connections between the classroom mathematics and real life which is all about modeling with mathematics (SMP 4). Furthermore, students reason abstractly and quantitatively (SMP 2), construct viable arguments and critique the reasoning of others (SMP 3), attend to precision (SMP 6), and look for and express regularity in repeated reasoning (SMP 8).

NOTE: If "Yes" is selected for "Seeking 'Honors' Distinction" on the "Course Description" page of the "New Course" submission process, please complete the remaining 2 text boxes below.

Corresponding Non-Honors Course: *Indicate the name of the regular non-honors course corresponding to this proposed honors course.*

Differences in Honors/Non-Honors Courses: *Describe in detail how this honors course differs from the regular course offered in the same subject area. Be specific. UC assumes Honors submissions will have increased level of reading and writing. Please be specific and descriptive regarding precisely how these increase the rigor of the course beyond merely increased amounts of work.*